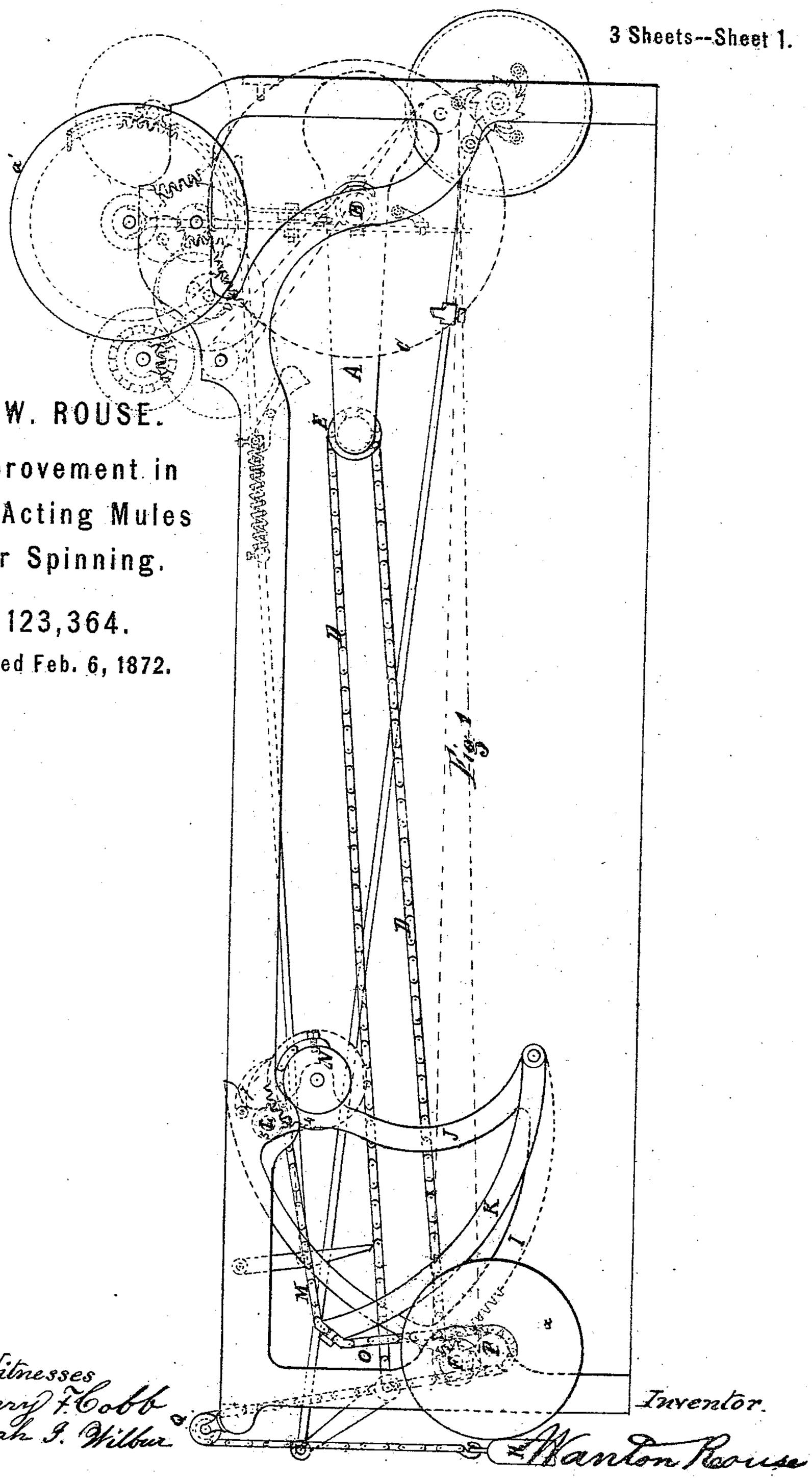
3 Sheets--Sheet 1.

W. ROUSE.

Improvement in Self Acting Mules for Spinning.

No. 123,364.

Patented Feb. 6, 1872.



Witnesses
Henry F. Cobb
Sarah J. Wilbur

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AM. PHOTO-LITHOGRAPHIC CO. N.Y (OSBORNE'S PROCESS.)

W. ROUSE.

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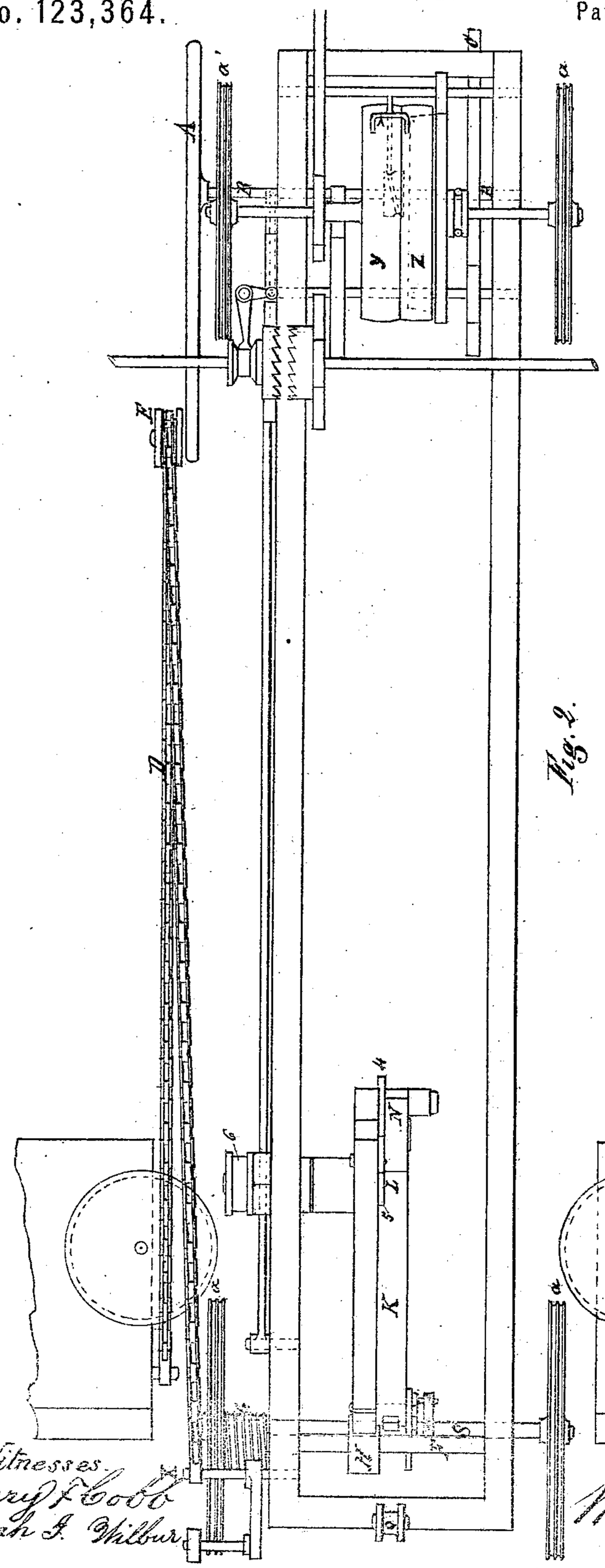

Fig. 2.

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W. ROUSE.

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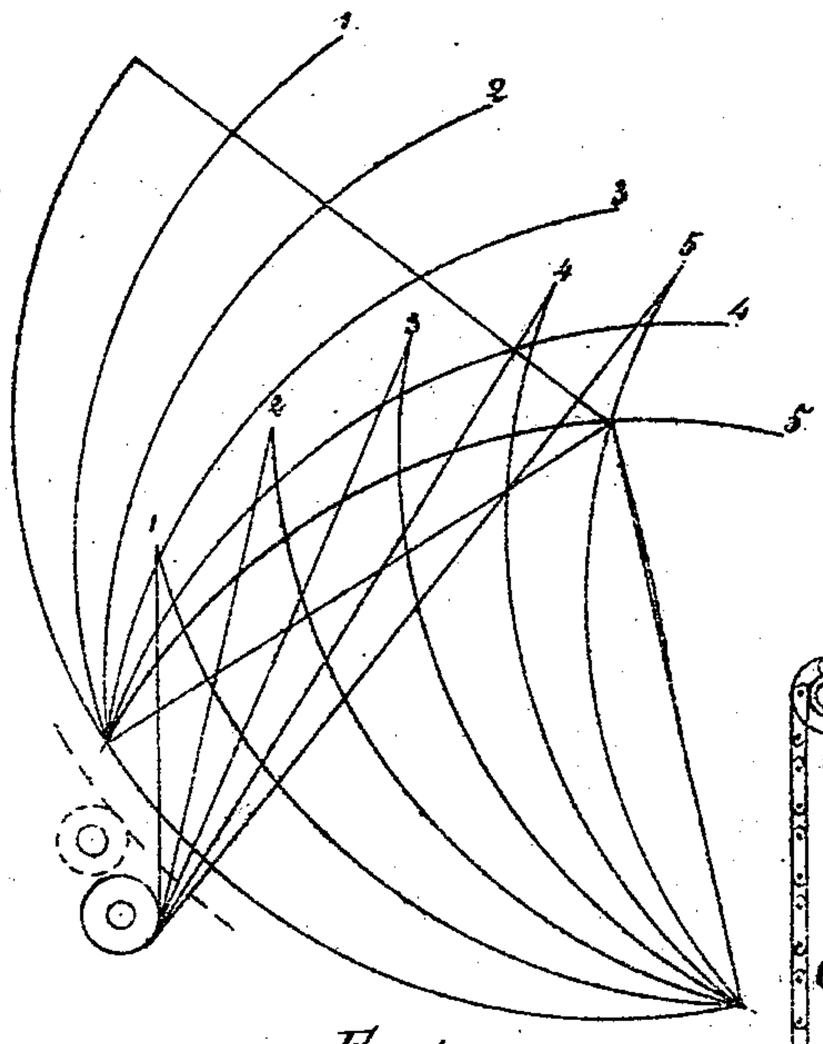
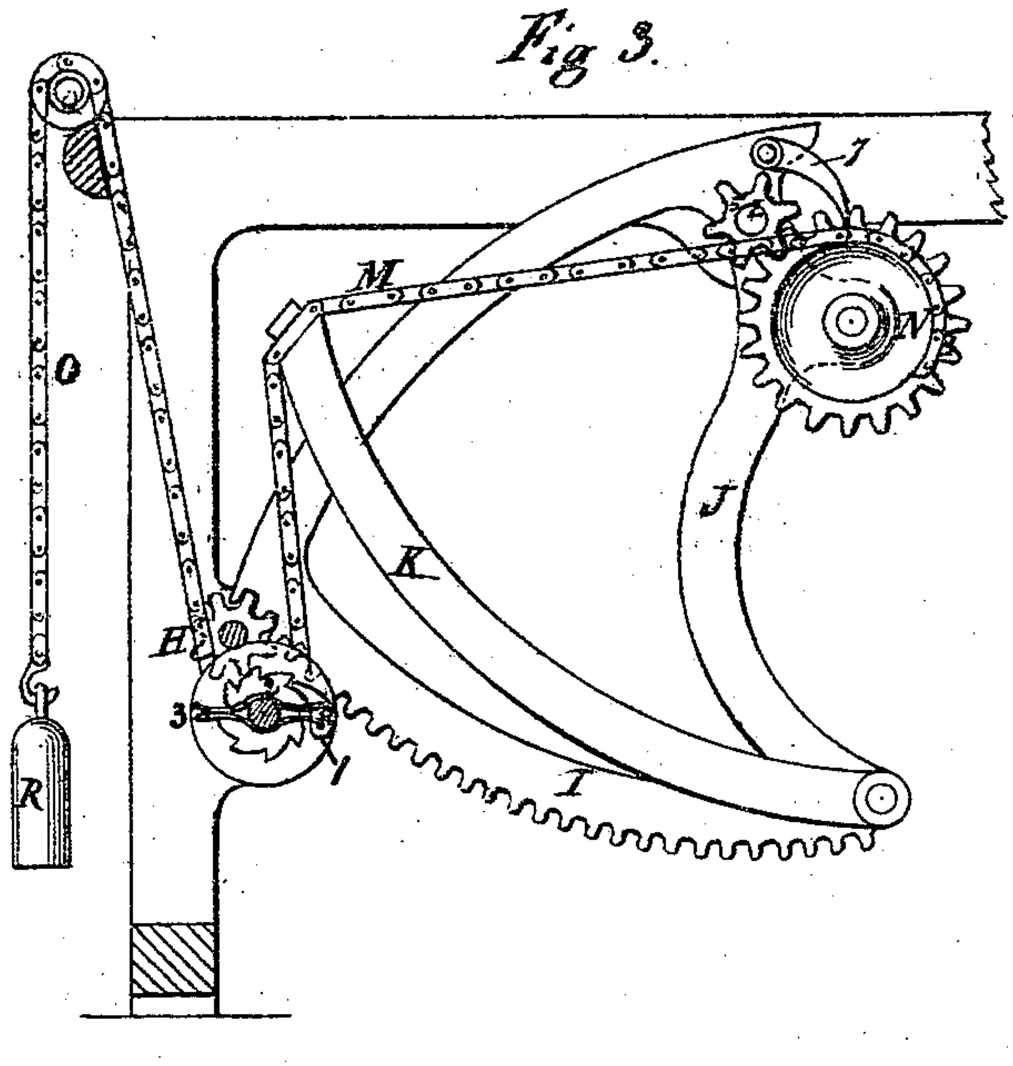


Fig 4

Fig 3.



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UNITED STATES PATENT OFFICE.

WANTON ROUSE, OF TAUNTON, MASSACHUSETTS.

IMPROVEMENT IN SELF-ACTING MULES FOR SPINNING.

Specification forming part of Letters Patent No. 123,364, dated February 6, 1872.

I, WANTON ROUSE, of Taunton, in the county of Bristol and State of Massachusetts, have invented certain Improvements in Self-Acting Mules, of which the following is a specification:

My improvements relate, first, to the running in of the carriage; and, secondly, to the mechanism for modifying the motion of the spindles while winding on the yarn during the running in of the carriage. It is important in running the carriage in to start and stop it gradually, its speed being at the highest at the middle of its course; and this is usually done either by a scroll or a crank motion, or an arm turning on a center with a pin or truck upon its outer end working in a vertical slot in the carriage; this pin or truck standing when the carriage is out a little below one dead-point, and when the carriage is in a little below the other dead-point the truck describing a little less than a semi-circumference. This is the type of nearly all the mechanisms heretofore used for running in the carriage, except those using the scroll, so called; and all mechanisms not containing an arm vibrating through a little less than half the circle are liable to objections greater than those necessarily incident to those operating upon that principle.

One objection to mechanisms containing this vibrating arm is that the carriage is not always drawn up to exactly the same spot, owing to the necessity of arresting the motion of the arm below the dead-point. I obviate this objection in my mechanism by using a revolving arm, which is connected by a chain to the carriage, and which pulls upon the carriage until it reaches the dead-point.

This application of a revolving arm to running the carriage in is not new in itself; but no such arm has ever heretofore, to my knowledge, been connected with the carriage by a chain or other flexible connection. This arm, like the vibrating arm, is moved by power applied to its shaft while operating to run the carriage in, and moved by power applied to the carriage while returning to its position at the beginning of the inward motion of the carriage.

In practice, I disconnect the shaft of this arm from the driving-power at the same time that the driving-power is connected to the mechanism for drawing out the carriage, although this is not essential, as the arm describes a complete circle, and is connected to the carriage by a chain. As the driving-power applied to the shaft carries the arm beyond that dead-point further from the carriage, the carriage is never, for even a moment of time, (when at the beam,) disconnected from the driving power, as it is controlled by the drawing-out mechanism just before it is freed from the control of the running-in mechanism, which is impossible when the vibrating arm is used.

When this revolving arm is connected to the carriage by a single chain, it is obvious that it must be of a length equal to at least half the distance gone over by the carriage when running in. For many reasons an arm of this length is objectionable, and in practice I decrease the length of this arm one-half by connecting one end of the chain to a stationary point, passing it around a truck on the arm, and connecting its other end to the carriage, when, as is obvious, the carriage will move twice as far as the truck on the end of the arm during the time it is operated by the arm. This part of my invention, it is plain, is equally applicable to the vibrating-arm.

It is essential that the speed of the spindle be such while the carriage is running in that the yarn will be wound upon them properly to form the cop. A variety of mechanisms are well know for this purpose, all of which are highly complex, and I know of none containing so few parts nor parts so simple in construction as mine.

All these mechanisms known to me heretofore had, as an essential feature, a chain, one end of which was controlled as to its position by the tension of the threads, and so arranged with relation to the other parts that when this end was near the center upon which the part to which it was attached vibrated the greatest amount of motion would be given to the spindles, and as this end was caused to recede from that position the motion of the spindles would be modified so as to form the base of the cop. In other words, the chain was substantially given out, as is plain in the common English mule, where the chain is wound upon a drum which travels from the point where this end of

the chain is attached while winding on, and where the motion of the drum is more or less as this end of the chain is moved more or less, so as to follow the drum. But in my mule this chain is not given out to decrease the motion of the spindles, but is taken up. I am, therefore, enabled to cause this chain to operate directly upon the shaft which carries one pair of the drum-band pulleys by means of a pulley or gear attached to that shaft, so that it is free to move in one direction without imparting its motion to the shaft, but cannot move in the other without rotating the shaft; and this I regard as an important part of my invention, as it goes far in itself to simplify the winding-on mechanism. So far as I know no one has ever heretofore so connected a reciprocating chain whose motions conformed to the motion to be imparted to the spindles with the shaft carrying the drum-band pulley; but I am aware that such a chain has been connected with that shaft by means of a rack and pinion, and a train of gears in the mule, patented to William Mason.

The motion to be imparted to this chain, in order to cause it to rotate the spindles properly to form the cop, is so well understood by all skilled in the art that it suffices to say here that it may be divided into two parts: First, that required to form the base of the cop; second, that required after the base of the cop has been formed.

The chain before referred to in the Mason mule has the requisite motion imparted to it to accomplish these objects by two mechanisms, the first and second of which act together to form the base of the cop. The second acts, practically, alone after the base has been formed; and other mechanisms may be devised for imparting this motion to this chain; but it is plain that that part of my invention which consists in connecting this chain directly with the shaft of the drum-band pulley, as before mentioned, may be embodied in any mule having a chain to which this required motion is imparted, regardless of the particular mechanism used to impart this required motion to the chain.

My mechanism for imparting this motion to the chain differs materially from any other known to me, and constitutes, also, an important part of my invention, as it is far simpler and more accurate in its operation than any other known to me. It consists essentially of the following elements: First, a vibrating arm moving in one direction as the carriage is run in, and in the opposite direction as the carriage is drawn out. Second, an arm on a stud upon the vibrating arm, so that it will move with the vibrating arm and be free to turn upon its stud. Third, mechanism controlled by the tension of the thread, which causes this latter arm to turn upon its stud.

It is plain that each point of the arm upon the stud will move through an arc of a circle at each vibration of the vibrating arm whose center is the center upon which the arm vibrates, and consequently that points upon the outer surface of the arm can be caused to travel varying distances by varying their distances from the center on which the vibrating arm vibrates. In other words, if all points on the outer surface of the stud-arm are at the same distance from the center of vibration, then all will move over equal arcs, but when one end of the arm is nearer the center of vibration than the other is, then the motion of the points on the outer surface of the arm around the center of vibration will increase gradually from that nearest the center to that furthest from it. All that remains, then, is to arrange this mechanism in such relation with the chain, that each of these points shall in turn impart its motion to the chain, which, as is obvious, is accomplished by attaching one end of the chain to the free end of the stud-arm, so that each point in the outer surface of the arm shall come successively in contact with the chain. As the stud-arm comes nearer and nearer the center on which the vibrating arm vibrates, the motion imparted to the chain grows less and less at the beginning, but is the same at the close.

It will be obvious, from what has been said, that any suitable mechanism may be used for actuating the vibrating arm, and also for controlling the stud-arm by means of the tension of the threads. And it is plain that a mule may be constructed which will embody this part of my invention without regard to the particular mechanism used for these purposes, or the particular mechanism used to cause the motion of the chain to actuate the spindles.

In the drawing, Figure 1 is a side elevation of my improved mule, and Fig. 2 a plan. Fig. 3 is a side elevation of my new winding-on mechanism, and Fig. 4 is a diagram intended to explain the action of the mechanism for imparting motion to the chain.

A is the arm which operates to run the carriage in. It is fast on the shaft B, and this shaft receives motion from the gear-wheel C, which is driven as in other mules from the drawing up of pulley Y—that is to say, the driving-power is connected to the gear-wheel C immediately after the "backing off" is completed, and is disconnected from that gear-wheel when the carriage is in. The mechanism for accomplishing this is indicated in the drawing, but is too well known to need description. The arm A, however, is controlled by this mechanism, as before stated, until it passes the dead-point. The carriage is then controlled by the drawing-out mechanism, and its motion outward pulls the arm A back to its first position. As before stated, if this arm be of the proper length a single chain may be attached at one end to the carriage and at the other to the arm; but the mode shown in the drawing is, for many reasons, preferable. D is the chain, one end of which is attached to a stud or stiff spring, X, projecting from the frame, and the other end is attached to the carriage. E is a pulley or truck attached to the end of the arm A. The operation is plain. I prefer to attach one end

of the chain to a stiff spring, so as to allow a slight yield when the carriage gets in, as thereby the carriage can be brought more exactly to the same spot and held there securely while the driving-power is connecting to the drawing-out mechanism. This chain is always made adjustable. F is a shaft, which is revolved in one direction when the carriage is run in, and in the other direction when it is drawn out, (by means of the drum G, in the well-known way.) On this shaft is a pinion, H, which, by means of the rack I, vibrates the arm J in one direction while the carriage is running in, and returns it to its first position while the carriage is drawing out. K is an arm attached to the vibrating arm J so that each point in it will move in an arc whose center is that on which the arm J vibrates—namely, L. The free end of this arm K is held at a certain distance from the center L by a chain, M, one end of which is fast to a drum, N, and the other fast to the arm K. O is a chain, one end of which is fast to the arm K, and which passes under the chain-gear P and over a friction-roller, Q, to a weight, R. This chain-gear P is so connected to the shaft S that it can revolve in one direction without imparting motion to the shaft—but not so in the other direction—by means of the well-known contrivances, consisting of the pawl 1, ratchet 2, and friction-finger 3, the friction-finger causing the pawl (fast to the chain-gear) to engage with the ratchet (fast to the shaft) when the gear P is revolved in one direction, and holding the pawl away from the ratchet under all other circumstances. When that part of the chain O which is attached to the free end of the arm K is as far from the center L as the chain M will permit, the spindles will receive their greatest motion during that vibration of the arm J which is caused by the running in of the carriage, as the chain O will receive its greatest motion and thereby revolve the gear P the greatest number of times, which, through the shaft S and the drum-band pulleys *a a*, rotates the spindle the greatest number of times, and as the arm K approaches the center L less and less motion will be given to the pulley P, and, consequently, less and less motion to the spindles, as the cop increases in size—that is to say, the motion at the start is less and less as the diameter of the cop increases at the base, but the same at the end. The length of the chain M is so adjusted in the first instance that the spindles will be rotated a sufficient number of times to wind the yarn on the base-spindles, and as the cop increases in size, and the number of rotations necessary for winding on diminishes, the tension of the yarn, operating upon the faller, throws a mechanism into gear which rotates the drum N and shortens the chain M until the motion of the spindles is sufficiently diminished to relieve the tension of the yarn. This mechanism consists of the gear 4 attached to the drum N, which is actuated by the gear 5, on the same shaft with the pulley 6, over which passes a belt, which belt lies between two nipping-fingers on the carriage, (in a well-known way,) which are actuated by the tension of the threads so that they nip and move the belt during the running in of the carriage, when the tension of threads requires the rotations of the spindles to be diminished, the belt thereupon causing the pulley 6 and its shaft and gear 5 to revolve, thus taking up the chain M. The pawl 7 holds the gear 4 and drum in place. This pawl is disengaged from the gear 4, when the cop is formed, by the attendant. The weight R retracts the chain O to its proper position as the arm J is vibrated inward while the carriage is drawing out.

It will be obvious that the means of vibrating the arm J, as also the means of taking up the chain M and retracting the chain O, admit of many modifications; for instance, the arm J may be vibrated in one direction by means of a drum on the shaft F and a chain with a weight to retract it, instead of the rack and pinion H, and the curved surface of the arm K may be varied in its relation to the center L by means of a rack connected to the arm K and gearing into the pinion 5; or by a screw, one end of which is swiveled to the arm K and the other passed through a nut which is revolved by the shaft of the gear 5, instead of by the chain M and its drum. But it is clear that none of these modifications will vary at all from the principle of my mechanism for imparting the proper motion to the chain.

It will be seen (from what has been said and from an examination of the drawing) that the motion imparted to the chain O depends primarily upon the relation of the acting surface of the arm K to the center L, (the amount of vibration of the arm J being constant,) as each point in that surface imparts its motion to that point of the chain which comes in contact with it.

It is obvious that a very great variety of motions can be imparted to the chain by this mechanism, depending upon the relation of the acting surface of the arm K to the center L, and other circumstances, which are obvious. Thus the motion of the chain will conform to that of the arm J when all the points upon the acting surface of the arm are equidistant from the center L, (the chain being at a tangent to this surface,) while, if the distance of these points gradually increase, the motion of the chain will be gradually increased. If the distance gradually decrease, the motion of the chain will be gradually decreased; and if the difference in these distances vary irregularly, the motion of the chain will vary irregularly, (within certain limits, which are obvious.)

Many mules have a mechanism for finishing off the points of the cops; but I prefer to do this by knocking off the faller later and later as the cop finishes. This will be understood by all skilled in the art, and in practice operates perfectly.

The curve of the outer surface of the arm K in the drawing is the same as that of the segmental rack I; but it is plain, from what

has been said, that this particular curve is not essential; and so of the relative proportions of the arms J and K, and the amount of the vibration of the arm J and the position of the chain O in relation to the mechanism which imparts motion to it. None of these points require exact description, as they all depend upon the particular motion required to be imparted to the chain O, and can readily be determined by any person skilled in the art.

It will be obvious, also, that this mechanism is applicable in all machines where any of the numerous motions which it is capable of imparting are desired.

What I claim as my invention is—

1. The running-in mechanism, consisting essentially of a revolving arm, A, connected to the carriage by a chain, D, or its equivalent, and suitable mechanism for imparting the required motion to the arm, substantially as de scribed.

2. The combination of the carriage, arm, truck, and chain, when arranged together substantially as described, so that the motion of the carriage is greater than the throw of the arm.

3. The mechanism for imparting motion to the chain O, consisting essentially of a vibrating arm, J, and an arm, K, vibrating with it, and having an acting surface capable of changing its relations with regard to the center L, and controlled by suitable mechanism as to this relation, the whole being substantially as above described.

4. The combination of the chain O, moving, as described, with the drum-band pulley-shaft S by means of the gear P, substantially as described, and as a special means for imparting the motion of the chain O to the shaft S, and through that shaft to the spindles.

5. The combination of the pulley 6, its shaft and gear 5, with the arm K, substantially as described, and as a special means for causing the tension of the threads to act upon the arm K.

6. The combination of the rack I and its pinion H with the arms J and K, substantially as described, and as a special means of imparting the vibrating motion to the arms J and K.

Witnesses: WANTON ROUSE.

HENRY F. COBB,

SARAH J. WILBUR.